TM-80 REGISTER AND PROGRAMMER USER GUIDE

MP MASTER
MA32645

GENERAL ELECTRIC

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INTRODUCTION

These instructions are designed to take an individual through the very simple steps required to start up a TM-80 programmer and meter and have them operate properly.

There are a couple of things you will notice as you begin to operate the TM-80 programmer and register. The TM-80 displays a military (European) date and time format. The date is displayed as day/month/year and the time as hour/minutes/seconds. The TM-80 uses a 24 hour format. Example: 11 = 11 A.M., 15 = 3 P.M., 22 = 10 P.M., 24 = midnight, etc.

Make friends with the CLEAR key on the TM-80 programmer. It is located approximately in the middle of the TM-80 programmer. It has the word CLEAR printed on the key. As you begin to go through these instructions, you may make a mistake and punch the wrong key. It is at this time that the value of the CLEAR key becomes obvious. If you push the CLEAR key, it gets you out of trouble by clearing the command mode you are in, so that you can start the instruction sequence over again. The CLEAR key is one of my favorites.

RECEIVING

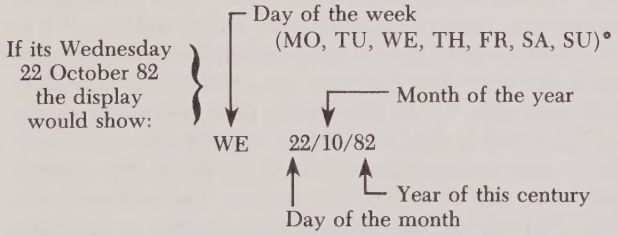
The first thing you should do when you receive your TM-80 programmer(s) and meter(s) is to unpack them and make sure that they have not been physically damaged in transit. Set the meter aside for the moment and let's concentrate on getting the programmer set up and operating properly. Take the programmer battery charger and plug it into a convenient wall outlet. Plug the other end of the battery charger into the back of the programmer where it says BATT CHG and let it charge up for a few hours. This is a good time to look at the front of the programmer and become familiar with the location of the various key pads. If you are not near the programmer, there is a drawing of the programmer front plate on page 11 of these instructions

SETTING UP THE PROGRAMMER

Welcome back. Now that your programmer is all charged up and ready to go, let's set up the date and time and get it operating properly.

The first thing you should do is push the button marked ON, which is located right next to the button marked OFF. You will see some numbers such as P = 03 = 22 = 12 (or some other numbers). When the programmer was shipped from Somersworth, it was fully charged and had placed into it the correct date and local Somersworth time. If it has been a long time in transit, the possibility exists that the batteries have run down and P = 00 = 00 = 00 shows on the display. In any event, the display should now be set up with the correct date and time in the following manner. First, push the button marked ENTER PROG DAT/TIM. This button is located immediately to the right of the ON button. Having pushed the ENTER PROG DAT/TIM button, you will see ENTER KEYWORD = 000000 displayed on the programmer. You must at this time enter the date/time keyword which allows you access to the programmer to establish the correct date and times. The date/time keyword is indicated on your programming sheets which you have received with your programmer. It is right smack in the middle of sheet 1 where the words DATE/TIME KEYWORD appear. It is a six digit number and can range from 000000 to 999999. If you happen to have one of the General Electric marketing sample programmers, the date time keyword is 123456. It it has taken you as long to read this paragraph as it has for me to write it, the programmer may have turned itself off. It will do this automatically if it doesn't receive any commands within a two minute period. Turn it on again by pushing the ON button and then push the ENTER PROGRAMMER DAT/TIM button again. And now, enter the date/time keyword by pushing the appropriate six digits on the numbered key pad on the extreme right-hand side of the programmer. (Example: Push 123456 You will now see ENTER KEYWORD = 123456 [or your number] in the programmer display window.) Having put in the correct six digits, now push the button marked ENTER. You will now see in the programmer display YEAR = 79 (or 80, 81, etc.). If the year is correct (i.e., if its 1980 and it says 80, or if its 1981 and it says 81), leave it alone. (This will apply to month, day, minutes and seconds, which follow.) If it is not correct, now is the time to punch in the correct year by using the same key pad that you entered the date/time keyword with. To do that merely push two buttons such as 8 followed by 2 (if it is 1982) so that the year now reads 82. If you entered two numbers, or left in the existing numbers, push the ENTER button. You will now see MONTH = 01 on the programmer display or perhaps some other month (02, 09, 11, etc.). In any event, now is the time to enter the correct month into the programmer. You do that by again pushing two digits on the numbered key pad. As an example, you may wish to enter 10 (push numeral 1 followed by 0), representing the month of October, the tenth month of the year. Having done that, again push the ENTER button. You will now see the word DAY = 01 or some other day appearing in the display. Now is the time to put the correct day of the month into the programmer. You do that by pushing the appropriate buttons on the numbered key pad. As an example, you might enter day 21. You do that by pushing the number 2 followed by the number 1. Now push the ENTER button again. You will now see on the display HOUR = 00 (or some other number 09, 12, 18—we use the military time format. 1 A.M. = 01, 2 A.M. = 02, 11 A.M. = 11, 12 noon = 12, 1 P.M. = 13, 5 P.M. = 17, 10 p.m. = 22, etc.). Now is the time to enter the correct hour of the day. As an example you might enter the digits 15 (representing 3 P.M.) by pushing the appropriate numbers on that same number key pad. Having done that, now push the ENTER button again and the word MINUTE appears on the display as MINUTE = 09 (or some other minutes). Now is the time to

enter the correct minute of the day into the programmer. You do that using the same key pad and punching in two digits. For example, you might punch in 04 and again push the ENTER button. Now you see the word SECONDS in the programmer display. It will appear as SECONDS = 27 or some other number. Now is the time to enter the correct seconds into the display. You could get a little creative here and punch in a few seconds ahead of the actual time. As an example, if it were exactly 20 seconds after the hour, you might punch in the numbers 25 and then at exactly the instant seconds on your watch reaches 25, NOW! push the ENTER button. Presuming you have done everything correctly, you will see the local time displayed in the following format: P = 15 = 04 = 25 (or whatever the correct local time is). Congratulations! You have now set up the correct date and time in the TM-80 programmer and are ready to move on to bigger and better things. It might be appropriate at this time to check the date and time to make sure they are correct. You can do that by pressing two buttons. First let's check the date. Push the button marked DISPLAY PROG DATE. This is located directly to the right of the button that you used to initiate the programmer date and time entries. You should see, after you have pressed that button, the correct date and day of the week. It will appear on the programmer display as shown in the following example.



*If you remember—you didn't have to put the day of the week in as the programmer puts it in for you.

This is a European date/time format commonly referred to as a military date/time format. Now, if you want to check the programmer time, you push the button directly to the right of the display programmer date button, and that button is marked DISPLAY PROG TIME. After you have pushed that button you will see the time that you have just entered into the programmer. As an example you might see P = 15 = 08 = 47, representing 3:08 P.M. and 47 seconds after the minute.

Note that the seconds do not advance. What you actually see displayed is the exact time contained in the programmer at the instant that you push the button marked DISPLAY PROG TIME. If you want to update the display you can continue pushing the button marked DISPLAY PROG TIME. Each time you push the button, you will update the time displayed on the front of the programmer. In summary, by using the two buttons, one marked DISPLAY PROG DATE and the other marked DISPLAY PROG TIME, you can check the date and time which you put into the programmer.

The following is a quick outline review of the steps you have gone through to enter the programmer date and time:

1. Push the programmer ON key
2. Push the ENTER PROG DAT/TIM key
3. Enter keyword—by pushing the correct dix digits on the numbered key pad
4. Push the ENTER key
5. Year—punch in the correct two digits using the numbered key pad
6. Push the ENTER key
7. Month—punch in the correct two digits using the numbered key pad
8. Push the ENTER key
9. Day—punch in the correct two digits using the numbered key pad
10. Push the ENTER key
11. Hour—punch in the correct two digits using the numbered key pad
12. Push the ENTER key
13. Minutes—punch in the correct two digits using the numbered key pad
14. Push the ENTER key
15. Seconds—punch the correct two digits using the numbered key pad
16. Wait—push the ENTER key
17. P = XX = XX = XX (the correct time should now show in the programmer display.)
18. Push DISPLAY PROG DATE—should show correct date
    Example: TU 21/10/82—representing Tuesday 21 October 1982
19. Push DISPLAY PROG TIME—should show the correct local time
    Example: P = 17 = 25 = 46—representing 5:25 P.M. and 46 seconds after the minute

SETTING UP METER CONSTANTS

This is easy isn't it? Let's move one step closer to programming the TM-80. Before you connect up the programming optical coupler to the meter, let's enter some meter data in the programmer. If you have gone away and had a cup of coffee you will probably have to turn the programmer on again. You do that by pushing the ON button (you should have this part under control by now). In the programmer display you will see the time displayed as P = XX = XX = XX. (There will be numbers where the XX's are.) Now push the button marked ENTER METER DATA which is directly above the ON button. What you see in the display now is METER CODE = 000000000 (or some other number). If you wish to put a code number in the meter for display or record keeping purposes, you can enter any nine, or less, digit number by using the numbered key pad. As an example, let's be creative and put in the following nine digits. 1, 2, 3, 4, 5, 6, 7, 8, 9. The display

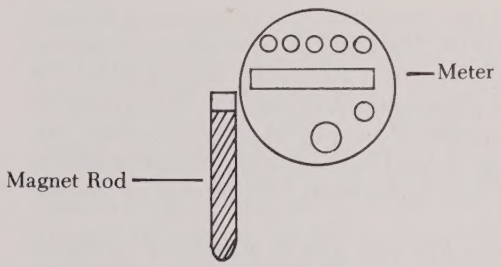
should now read METER CODE = 123456789. Now push the ENTER button. You will see in the display the following: K_h = 007.200 (or maybe some other number). If you want to enter a particular K_h now is the time to do it. I kind of like 7.2, but let's try something else. This gets a little tricky here. You will notice if you push a number like 5 (go ahead, push 5), everything goes to 0 and the 5 becomes the last digit over in the extreme right-hand side of the display. What you will see now in the display is the following: K_h = 000.005. If you want to move that 5 over to the left of the decimal point, you have to hit the 0 button a couple of times. Try it, punch 00, notice that the 5 moved over two positions. Punch 0 again, notice now the 5 is just to the left of the decimal point. Let's try entering a K_h like 7.2 again. Push 7, then 2, then hit the 0 button two times. What you will now see in the display is K_h = 007.200. Now push the ENTER button. Congratulations! You have entered a K_h in the programmer. You now see TRANS FACTOR 000001 (or some other number) in the display. This is the transformer factor. I kind of like 1, but you can enter any number you want. To enter the number you use the numbered key pad again. Now push the ENTER button. The display now reads DECIMAL POSITION = 02. This happens to be a great position for the decimal point in the TM-80 demand display. If you wanted something like 1 or 3 decimal positions, you could go ahead and punch it in at this time. I kind of like 2 so I am going to leave it there and push the ENTER button again. Now the display has a funny little caret (⅄) on the extreme left side that we call a prompt. The prompt (⅄) indicates that the programmer is "ON" and ready to receive further instructions. Believe it or not, at this point in time you are now ready to program a TM-80 meter with the information that you have put in along with the programming information we have installed in the programmer at the factory. But!

Let's take a minute here and review the step-by-step procedures you just went through to set up the meter data:

1. Push the ON key
2. Push the ENTER METER DATA key
3. Meter code number—if you want, punch in numbers using the numbered key pad
4. Push the ENTER key
5. Kh = XXX.XXX—punch in the correct numbers using the numbered key pad
6. Push the ENTER key
7. TRANS. FACTOR XXXXXX—punch in the correct numbers using the numbered key pad
8. Push the ENTER key
9. DECIMAL POSITION = XX—punch in the correct numbers using the numbered key pad
10. Push the ENTER key
11. Prompt (⅄)

SETTING UP THE METER

Now before we can program a TM-80, you have to have a meter equipped with a TM-80 register somewhere near the programmer. Plug the meter into a socket which is wired to correct operating voltage. That will be either 120, 240, 277 or 480 volts. Please be sure that the correct voltage is connected to the connect terminals. At $250 plus for a TM-80 register, you don't want to burn one out by applying the wrong voltage. Now that you have the meter equipped with a TM-80 register properly connected, take the battery that we shipped to you and insert it in the meter. To do this you take the battery and attach the end with the big gold cap, to the magnet rod that we supply as an accessory item. (I hope you bought a magnet rod.) The other end of the battery is marked with a + sign and a little arrow that points toward that end of the battery. This is the positive end of the battery and should be inserted into the meter first. Open the battery port and push the battery in the meter. That was easy wasn't it? Now the battery is all connected and in place. Next turn the power to the meter ON. What you see staring at you is a blank display. If you want to see some numbers on the display, you can. To do that you can use the rod you inserted the battery with. Run the rod (magnet end up) next to the left-hand side of the meter cover. Start at the front of the meter cover and move toward the back of the meter.

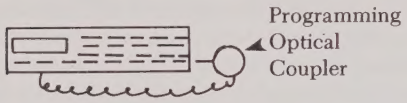


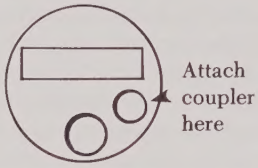
What you will then see on the TM-80 display is a string of nine zeroes appearing on the register. Then you will see some other numbers following in sequence, such as 01 01 01 00, followed by 02 00 01 (or maybe some other numbers). Then you will see 03 00000. Then you will see an error code. It will appear as Er 000010. You really don't need to know what this is at this point in time so we will discuss this later on. Now here your TM-80 sits with the error code showing in the display, the battery installed and the meter energized at the proper operating voltage. The register is not programmed at this point in time. But it is ready to be programmed and that is what we are going to do next.

PROGRAMMING A TM-80 REGISTER

Well, if you hung in there this far you are ready for the big step. Take the programmer into which you have put the proper date and time. Remove the programming optical coupler which is located on the back right-hand

side of the programmer and attach it to the meter mating optical port in the correct position.





The programming coupler is self-aligning and it holds itself in place to leave your hands free for programming, which helps. Now, push the button on the programmer that says ON. The programmer display should come up with the correct local time P = XX = XX = XX. Now before you can program an unprogrammed meter, you have to have the correct identification number in the programmer. To get the correct identification number in the programmer, you push button No. 4 on the numbered key pad which has printed above No. 4 the words PRESENT ID. Go ahead, push the button. The programmer displays PRESENT ID = 00. This could be some other number like 38, 24, 36—whatever. If it displays 00, leave it alone, if it displays some other number, change it to 00 by punching in, using the numbered key pad on the programmer, two zeroes. Now, push the ENTER button. The programmer display went back to the funny little prompt on the left-hand side (ↄ).

You're ready. The time you've waited for is close at hand. Push the button on the programmer labeled PROGRAM METER. You will see the prompt display respond with the words PROGRAM NUMBER = 01 (could be some other number like 02, 03, 04). Now is the time to select the program you want, either 01, 02, 03 or 04 (there are only 4 programs in the programmer) and insert that program in the meter. To do that, merely select a program number such as 2. (If you have the marketing sample programmer, program #2 is a great show and tell program so push the numbered button marked 2.) Note the prompt display now reads PROGRAM NUMBER = 02. Now, push the ENTER button. The programmer prompt display now reads PROGRAMMING METER and in a few seconds will change to read FINISHED PROGRAMMING. You have now completely programmed a TM-80 register. Hooray! At this point the register display may not be scrolling. It may still be hung up on the error code, Er 000010. If that is the case, simply take the magnet rod and quickly run it by the left-hand side of the meter (magnet end up) and the meter display will begin scrolling.

Now let's check some of the data we just programmed the meter with. First let's check the meter date. This can be done by pushing the button on the programmer that says DISPLAY METER DATE. This button is located immediately to the right of the button that says PROGRAM METER. Go ahead, push the button. The programmer responds with the words READING METER. Then, whoops, what do you know, you get a code that says TRANSMISSION ERRORS. Well, what happened here? *You need to remember in all your operations with the TM-80 that it does not like to talk to strangers.* Right now the TM-80 that you have just programmed thinks that some stranger is trying to talk to it. The reason it thinks that is because the programmer hasn't responded to the TM-80 with the correct security code. I don't think it is appropriate for this document to get into a detailed discussion of what makes up the security code. You may think of it as a key which allows you to "talk" to the meter. Without that key, you just cannot talk to the meter. Well, the question is how do we get to the correct security code? The answer is simple. You go back and push the button marked PRESENT ID (note this is No. 4 on the numbered key pad), and you will see on the display the words PRESENT ID = 00.

DON'T FORGET ABOUT THE "CLEAR" KEY, YOU MIGHT NEED IT SOON.

Remember, that is the ID number you used to program an unprogrammed meter with. You now need to change that identification code to the one which corresponds to the code which was inserted in the meter. If you are using the marketing sample program and you inserted program 2 as suggested earlier, the correct ID number that you need to insert at this time is 2. You do that by merely pushing the button marked 2 on the numbered key pad. The programmer now displays PRESENT ID = 02. Then you push the ENTER button. You have now entered an ID code of 2 into the programmer and the programmer display has returned to the prompt (ↄ). If you do not have a marketing sample program and are using your own programs, look on the very front page (sheet 1) of the programming sheets supplied with the programmer. You will see a column of program numbers 1, 2, 3 and 4. Next to them is a column of numbers headed with the words PROGRAM ID #. They should be whatever you've specified when you told us what you wanted in your programmer. (If you are using the marketing sample program, the program ID # will be 1, 2, 3 and 99. If you had inserted program #1 into the meter and you want to "talk" to that program, you need to have ID#1 punched up in the programmer. Likewise, if you inserted program #2, you would need to have ID #2 punched up in the programmer. If you had inserted program #3, you would have to have ID #3 punched in the programmer, and lastly, if you have inserted program #4, you would need to have ID #99 punched in the programmer.) You could have any program numbers 1 through 4 associated with any ID's 01 through 99 (but only four ID's at a time). In any event, on the programming sheets included with your

programmer there will be a list of the program numbers and their associated ID codes.

Back to talking to the meter. Having punched in the present ID of 2 (or the correct ID # for your programs), and having pushed the ENTER button, now let's go back and push the button marked DISPLAY METER DATE. It is in the middle of the lower keys, right above the button that says DISPLAY PROG DATE. After you push the button, the words READING METER will appear in the display and very quickly thereafter you will see the day of the week (abbreviated MO, TU, WE, TH, FR, SA, SU) followed by two sets of numbers appearing in the programmer display. As an example of what you will see might be [TU 21/10/82 21/10/82] (assuming it's Tuesday the 21st of October, 1982). What you see on the left-hand side is the date that is actually in the programmer. (Example: Tuesday, the 21st of October in the year 1982.) Appearing on the right-hand side is the date that is actually in the meter. (Example: The 21st of October, 1982.) What do you know, they are the same, and they should be or something's wrong. Now let's check the meter time. To do that you merely push the button that says DISPLAY METER TIME. This is located directly above the button that says DISPLAY PROG TIME. Go ahead, push the button. Again you see the words in the display READING METER and very quickly those words go away and you see two sets of numbers appearing in the programmer display. Assuming it were 1:24 P.M. and 12 seconds after the minute, you might see something like the following:

P = 13 = 24 = 12 M = 13 = 24

What the display is showing you is two times. The first is the programmer time, indicated by the P and it is 13:24 and 12 seconds. Note this is a military time format and is interpreted at 1:24 P.M. and 12 seconds after the minute. Right next to the programmer time is the meter time (less seconds) indicated by the M equalling 13:24. Again, for those who are not familiar with military time, military time uses a 24 hour clock. The hours 1 A.M. to 12 noon would be displayed very similarly to standard time presentation of 1 A.M. to 12 noon. However, from 12 noon on, the hours would appear as: 13 = 1 P.M., 14 = 2 P.M., 15 = 3 P.M., etc.

WHAT ABOUT THE OTHER BUTTONS?

Verify Program

Well, we are not quite finished yte. There are a few more things you can do with a programmer/meter combination which are kind of fun. The first is that you can verify a particular program that you have put in the meter. To do that is pretty simple, you only have to push the button on the programmer number key pad which is numbered 2. At the top of the button numbered 2 you see the words VERIFY PROGRAM. Having pushed the button, the programmer now displays PROGRAM NO. = 02. (Note this could be 1, 3, or 4, depending on how you had left the programmer when you last used it.) If you have inserted program No. 2 in the meter as discussed earlier, you now need only push the ENTER button, go ahead, push it, and you will see the words VERIFYING PROGRAM displayed, very quickly thereafter you will see the display change to PROGRAM VERIFIED. You have just completely checked out the program in the TM-80 register in a very few seconds. Let's try it again, for a program that you know is different from the one you put in the register. Let's go back and push button No. 2 again (VERIFY PROGRAM). Note the programmer display shows PROGRAM NUMBER = 02 (or whatever number you had in there before). Now let's try another number. Change it to 3. You do that by pushing the button No. 3. (You could use any number 1 thru 4 which is different than the number you used before.) Now push the ENTER button. The display again shows VERIFYING PROGRAM. Very shortly thereafter it changes to PROGRAM NOT VERIFIED. What do you know. You tried to check the TM-80 for a program you know is not in it, and sure enough it responded and told you it was incorrect. Will miracles never cease?

Clear

Let's try a few more things. Just for the fun of it, push the CLEAR button. You may not have done that yet, note that the display goes back to the funny little prompt (ʎ) on the left-hand side again. As stated before, the CLEAR button can be used to get you out of any sequences that you may be involved with. As an example, if you only wanted to change one piece of meter data, you could run through the steps to get you to that particular piece of meter data, change it and hit the CLEAR button and not have to perform any more entering functions for any other data. In short, the CLEAR button is a handy little button that will bail you out in a pinch. If you enter in "bad" data and want to go back and start all over again, punch the CLEAR button.

Monthly Reset (yes or no)

Let's try a monthly reset. How do you do it? Simple. You push button No. 3 which has printed above the numeral 3, MONTHLY RESET. Well, did you do it? If you did, you will see the words MONTHLY RESET? appearing in the programmer display. Now what do you do? Well, you push the button 7 or 9, depending whether you want to reset the demand values or not and then enter it. Let's try it with a yes answer first. (Yes tells the programmer that you want to proceed with the monthly reset.) So, go ahead, push button 7 which says YES above the numeral 7. YES just jumped into the programmer display. Now go ahead and push the ENTER button. The programmer displays RESETTING METER and the display very quickly changes to FINISHED MONTH RESET. If you had glanced over and looked at the TM-80

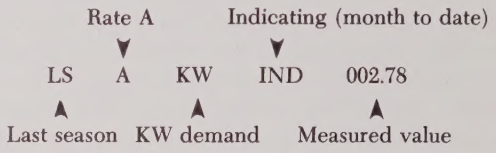
register during the time it was resetting, you would have seen an all 8's display come up on the TM-80 register display. The same all 8's display you would see if you performed a manual reset on the TM-80. To do that, lift up on the sealable port reset arm and turn it counterclockwise [↺] until you see the paddle on the other end of the reset arm depress the reset switch blade which is sticking on the TM-80 register front plate. You can reset the meter with either the manual reset, or the programmer. Cute eh?

New Battery (yes or no)

Now let's try button No. 1 which has printed above the numeral 1 NEW BATTERY. If you push that, you see the words NEW BATTERY? You guessed it, either punch in YES or NO again. This time, let's try button No. 9 which says NO. Go ahead, push it. Note that NO jumps into the display. (No tells the programmer you changed your mind and don't want to go through with the instructions it has.) Now push the ENTER button. Well, what do you know, nothing happened, you went back to the prompt (ↄ). Let's try that all over again. Push button No. 1 again (NEW BATTERY). You get the same display NEW BATTERY? Now push button No. 7 that has YES printed on it. What do you know, the YES jumped into the programmer display, now push the ENTER button, the programmer now displays ZEROING BATTERY TIME and then very quickly changes to BATTERY TIME CLEARED. You might want to go through this exercise if you were putting a battery in the TM-80 and wanted to clear out any minutes of carryover shown in the TM-80 display.

Display Data

There are two buttons left we haven't pushed, let's try No. 6 DISPLAY DATA. Well, go ahead, push it. What do you know, the programmer display quickly shows READING METER and then changes to METER CODE NUMBER= 123456789 (or whatever other number you may have put in there). If you would like to see some of the other meter data, just keep pushing the ENTER button, push it once, the display jumps to Kh = 007.200 (or some other number). Push the ENTER button again, now the display shows TRANS. FACTOR 000001 (or some other number). Now push the ENTER button again and it shows the program ID, it appears as PROGRAM ID 2 (or some other number). Now push the ENTER button again. The programmer display now displays the TIME ON BATT 000000. (No question about this, you just reset it to 000000 a few minutes ago—unless you did it wrong.) Now push the ENTER button again, on the programmer display you will see the words DAY LAST RESET 028 (or some other number). This represents the day the meter was last reset and it is displayed as the Julian day of the year. In Julian time, 1 equals January 1 and 365 equals December 31 (366 if its leap year). Since we just performed a monthly reset a little while ago, the day shown is that number day of the year that it is today. Trust me! Now push the ENTER button again. If there was an error code showing in the meter display, the programmer will display ERROR 000001 or whatever code was displayed on the meter. There is a list of error codes in the troubleshooting guide in the back of the book. If no error code was displayed on the meter, then you will see METER READINGS? displayed. If you want to review the meter readings, press YES, then ENTER. Each time you press the ENTER button you will see a new metered quantity displayed. After you have gone through all the values which are displayed by the meter, the programmer will begin displaying values not displayed by the meter. An example of what you will see is:



After you have pushed the ENTER button enough times to get through all the displayable quantities, you will see REPEAT?

You guessed it, YES or NO. If you push YES the whole cycle is repeated if you push NO, back to the prompt (ↄ).

Recall Data

If you push this button you will recall the data from the last meter read. You can run through the values by pushing the ENTER button each time you want to see a new value displayed. You need only repeat the same procedures used for the display data button.

The ability to recall data from the last meter read is lost if the PROGRAM METER or VERIFY PROGRAM buttons have been used since a meter was last read by the programmer.

Programmer Self Checks

If you are not thoroughly confused by now, continue on and do some more fun things with the programmer. Let's go back to our ENTER programmer date and time mode of operation and look at what happens if you try to put in some incorrect data. Push the ON button, push the ENTER PROG DAT /TIM button, now enter the key word. If it is the marketing sample, use 123456. If not, use the key word on the front of your programming sheets, the same one you used before. Now push the ENTER button. If you have pushed the right keys thus far, you should see on the display, YEAR = 82 (or whatever it is). Let's change that, let's make it something way off in the

future like 99. So punch in 99 and then hit the ENTER button. Now the prompt display shows MONTH = 10 (or whatever it is). Let's try putting in a month like 15. Punch in 1, 5, ENTER. Well, what do you know, the month didn't take. The display returned to 0's. The display now shows MONTH = 00. What has happened is that the programmer did a "reasonableness check" on the data, determined there were only 12 months in a calendar year, and therefore will not accept the number 15. So let's go back and put in a real month. (Example: If it is October, punch 1, 0, ENTER.) Now the display shows DAY = 21 (or some other number, hopefully it is the day that you are reading this instruction and working with the programmer). Now let's try to enter a day like 35. Punch in 3, 5, ENTER. What do you know. The display goes back to DAY = 00. You guessed it, the programmer won't accept any more than 31 days, so let's go back and enter the right day again. Punch the correct day and ENTER it. (Example: you could use 21 again, punch 2, 1, ENTER.) Now we are at the hours. You guessed it, if you try to enter more than 23 hours, it won't accept it. Go ahead, try it. Don't forget to leave it with the correct hours. I think you get the picture at this time. If you go through minutes and seconds and you try to exceed 60 of either, the programmer will not accept it. (Don't forget to continue through to the end of the time set cycle *or* push the CLEAR key before going on.)

Now let's try to reprogram the meter again. Remember, you still have year 99 entered in the programmer. First, push the button marked PROGRAM METER. Select the program number. Let's try 2, you do that by punching 2, ENTER. (If you get TRANSMISSION ERRORS, check your ID code. It should match the last one you put the meter or—the TM-80 won't talk to you.)

The display now shows PROGRAMMING METER. It then very quickly changes to WRONG YEAR FOR PROG. What does this mean? What it means is the TM-80 is programmable for five years only. You're sitting here in the year 1982 (83, 84, 85, etc). and asking it to put a program in for the year 1999. The programmer knows it doesn't have a program for 1999 so it indicates that on the programmer display. If you want to correct it, go back and push the ENTER PROG DAT/TIM, punching in the correct key word. (Example: 123456 for the marketing sample). Push the ENTER button. You now see the YEAR = 99 on the programmer display, and change it back to 82, or whatever year you are reading these instructions in. Now push the ENTER button and finish running through the entire sequence, making sure that the month, day, hour, minute and seconds are correct. Now, if you again try to program the meter by pushing the PROGRAM METER button, selecting the program number 2 and pushing the ENTER button, you will notice that the meter will now accept the program. You know that because when it is all done the programmer says FINISHED PROGRAMMING. Not bad for a black box eh?

TM-80 DISPLAY

Now forget the programmer for a few minutes and let's play with the meter a little bit. Assuming these directions make any sense at all, and you have been able to program the meter and get it to scroll, with either the marketing sample programs or your particular program, let's see how to speed up the scroll, stop it, slow it down, etc. First, take the magnet rod with the magnet end up and hold it in your left hand. Starting at the very front of the meter cover on the left-hand side, take the magnet held against the cover and slide it from the front to the back of the meter reasonably slowly until the display initializes to the first quantity of its programmed scroll. This is the initialization stage of the display using the magnet rod. If you want to try it once or twice, be my guest, it's very easy.

Now let's say you want to fast-forward the display to look at a particular number. If you will, for a minute, take a look at the left-hand side of the TM-80 register, the very middle circuit board (the circuit boards are the three green things sandwiched between the two aluminum end plates), you will see a little glass tube with a couple of wires in it mounted on that middle board. That "thing" is called a reed switch. That is the switch you activated with the magnet which causes the display to speed up, slow down or freeze. When you are moving the magnet around the register, you kind of want to get it as close to that switch as possible with the magnet parallel to the switch.

Let's speed the display up. You do that by taking the magnet and holding it in a vertical position (magnet up) on the left-hand side of the TM-80 at about the position of the reed switch, notice the display starts scrolling very rapidly. If will scroll very quickly—through one complete cycle and then go back to the normal scroll display mode, even if you continue to hold the magnet there. Let's try it a little different way. Take the magnet away, now put it back in the same vertical position again near the reed switch, notice it initializes and starts to scroll very quickly.

Now remove the magnet before the end of the scroll cycle and you will see the display stop at the quantity at which you removed the magnet (more or less). At this point in time the display is frozen at that particular quantity and will stay there for approximately 5 minutes and then the display will return to its normal scroll sequence. You can, if you want to, manually step the display through additional quantities by taking the magnet and positioning it near the very front of the cover and sliding it toward the back of the meter again. Once for each time that you want to step through the display scroll. It takes a little bit of getting used to but the magnet does allow you to interface with the display so that you can (1) initialize it, (2) cause it to fast-forward, and (3) cause it to manual step. Try it a few times, I think you'll quickly get the hang of it.

There is one facet of the TM-80 programmer/meter operation you may encounter. It is a display which can appear on the programmer when the meter does not respond. To simulate it, you can try programming a meter

when the programmer *is not connected to the meter.* (Disconnect programmer coupler from the meter now!) Merely turn the programmer on, push the ON button, then push the button marked PROGRAM METER, then push the ENTER button. The display in the programmer will show PROGRAMMING METER and then very quickly change to METER NOT RESPONDING. This indicates that the meter is not talking back to the programmer. The usual conditions under which this happens are (1) there is no power applied to the register, or (2) the optical coupling from the meter cover to the register circuit board is not connected properly, or the programmer is not connected to the meter.

These instructions are not comprehensive, nor do they have a lot of technical detail to explain everything that you have just done with the TM-80. They are written, hopefully, in a clear and understandable way so that you can get going programming your TM-80 registers and begin to get the feel for how the register and programmer operate. If you want more detailed information, I suggest that you refer to the instruction book, programming sheets, programming instructions, programmer instruction book, and any other support information which you have available for the TM-80 register.

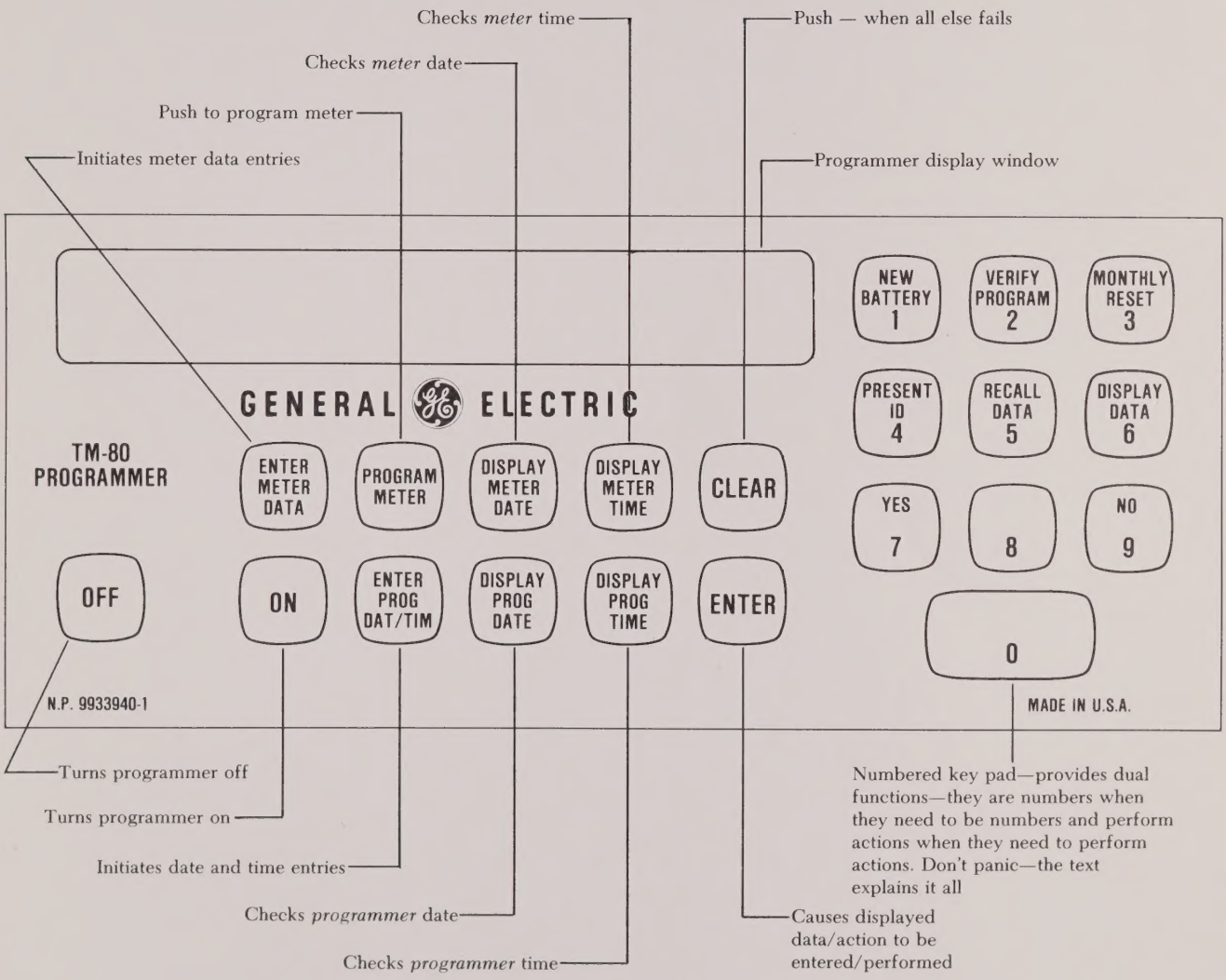
TM-80 TROUBLESHOOTING GUIDE — Programmer

SYMPTOM	PROBABLE CAUSE	REMEDY
Programmer displays METER NOT RESPONDING	a. Programmer probe not connected to meter	a. Connect probe
	b. Register not energized with rated AC voltage	b. Energize register
	c. Communication link cable inside meter cover not connected to register	c. Remove cover and connect cable
	d. Defective cover assembly	d. Replace cover assembly
	e. Defective electronic module	e. Replace electronic module
Programmer displays TRANSMISSION ERRORS	a. ID code in meter does not match present ID in programmer	a. Change present ID in programmer to match ID of program in the meter
	b. Defective electronic module	b. Replace electronic module
Programmer displays WRONG YEAR FOR PROG	a. Wrong date entered in programmer	a. Change date entered in programmer
Programmer displays NO PROG FOR THAT ID	a. Present ID in programmer not contained in PROM	a. Change present ID in programmer to one contained in the program PROM
Programmer display flashes	a. Programmer battery is low	a. Recharge battery
Programmer display blank and will not turn on	a. Fuse missing or blown	a. Install new fuse

TM-80 TROUBLESHOOTING GUIDE — Register & Meter

SYMPTOM	PROBABLE CAUSE	REMEDY
Display not lighted	a. Register not energized with rated AC voltage	a. Energize register
	b. Display in nighttime mode	b. Actuate display with magnet rod
Display shows a continuous Er 000001	a. Battery not installed	a. Install battery and initiate display sequence with magnet rod
	b. Battery installed backwards	b. Install battery correctly and initiate display sequence with magnet rod
	c. Battery defective	c. Replace battery and initiate display sequence with magnet rod
Display shows a continuous ER 000010	a. Register not programmed	a. Program register
Display shows a continuous Er 000011	a. Combination of Er 000010 and 000001	a. See above for Er 000010 and Er 000001
Display shows a continuous Er 000100 or Er 000101 or Er 000110 or Er 000111	a. RAM error in combination with other errors	a. Replace electronic module
Display shows a continuous Er 001000 or Er 001001 or Er 001010 or Er 001011 or Er 001100 or Er 001101 or Er 001110 or Er 001111	a. ROM error in combination with other errors	a. Replace electronic module
Display "stuck" and showing one number continuously	a. Display in step mode	a. Use magnet rod to advance display
Magnet rod will not activate, initialize or advance display	a. Magnetic rod not positioned properly	a. Hold magnet rod against meter cover and parallel to reed switch on logic board
	b. Magnetic reed switch damaged or defective	b. Replace electronic module

Register loses program and data during power outage	a. Battery not installed b. Battery installed backwards c. Battery defective	a. Install battery b. Install battery correctly c. Replace battery
No accumulation of kilowatthours on mechanical register or digital display	a. Register not properly meshed	a. Adjust register mesh
Kilowatthour accumulation on mechanical register does not agree with digital display	a. Mechanical register and digital display did not both start from zero b. Register not programmed with proper Kh c. Mechanical Rr is incorrect d. Shutter disk has incorrect number of slots	a. Zero both registers b. Reprogram with proper Kh c. Replace ratio assembly d. Replace adapter assembly
Accumulation on mechanical register only	a. Register not energized with rated AC voltage b. Optics assembly defective c. Electronic module defective	a. Energize register b. Replace adapter assembly c. Replace electronic module



PROGRAMMER FRONT PLATE

METER BUSINESS DEPARTMENT
GENERAL ELECTRIC COMPANY
SOMERSWORTH, N.H. 03878

GENERAL ELECTRIC

MP MASTER
MA32645